

## CLIMATE RESILIENCE DESIGN STANDARDS AND GUIDELINES TOOL (BETA)

### USER GUIDE

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## 1. Climate Resilience Design Standards and Guidelines Overview

### 1.1. Resilient Massachusetts Action Team (RMAT) Background and Context

Led by the Executive Office of Energy and Environmental Affairs (EEA) and the Massachusetts Emergency Management Agency (MEMA), the Resilient Massachusetts Action Team (RMAT) is an inter-agency team comprised of representatives from each Secretariat, who are supported by agency staff, stakeholders, and subject matter experts. The RMAT is tasked with monitoring and tracking the State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) implementation process, making recommendations and supporting agencies on plan updates, and facilitating coordination across State government and with stakeholders, including businesses, cities, and towns.

The RMAT is advancing prioritized cross-agency actions from the SHMCAP with the Climate Resilience Design Standards and Guidelines project. The Climate Resilience Design Standards and Guidelines are intended to help incorporate climate resilience into capital planning projects with physical assets owned and maintained by state agencies, through:

- **Beta Climate Resilience Design Standards Tool:** a beta web-tool for agencies that provides a preliminary climate risk screening output and recommended climate resilience design standards for State projects with physical assets; and
- **Climate Resilience Design Guidelines:** guidelines, best practices, and forms for State agencies to support implementation of climate resilience design standards.

The beta Climate Resilience Design Standards Tool and Guidelines are **accessible at** [[https://resilientma.org/rmat\\_home/designstandards/](https://resilientma.org/rmat_home/designstandards/)].

### 1.2. How to Use this Document

This User Guide (“the Guide”) walks users through the beta Climate Resilience Design Standards Tool (“the beta Tool”). Visuals and screenshots are used to show standard views, key features and functions, and text descriptions provide overviews of actions at each step in the process.

## 2. Beta Climate Resilience Design Standards Tool

### 2.1. Introduction to the beta Tool

#### *Purpose*

The purpose of the beta Tool is to provide projects with a preliminary climate exposure and risk rating and to support the integration of climate resilience design standards and guidelines into state funded projects with physical assets. The web-based screening tool is grounded in scientific methodology and uses available climate science data for Massachusetts, and will be updated over time to incorporate new science, additional or evolving climate parameters, and on-going stakeholder feedback.

The beta Tool is intended for relevant state grant-funded projects throughout the Commonwealth and capital projects by various State agencies. **The beta Tool does not take the place of statutory regulations or requirements, and does not replace detailed risk and vulnerability assessments, engineering alternatives analyses, or cost-benefit analyses.**

## User Roles

There are three primary users. Each type of user has different capabilities and roles within the beta Tool, as described below.

- **Reporter:** Can create new projects, edit, and view their own projects. This is the default user type.  
For example, this user may be a municipal staff member submitting a project as part of a state grant application.
- **Viewer:** Can view all saved and submitted projects, including inputs and outputs.  
For example, this user may be a State grant administrator.
- **Administrator:** Can view and edit all projects in the beta Tool. Administrators are limited to select EEA IT staff.  
For example, this user may be an Agency Administrator or IT staff.

This Guide provides step-by-step guidance for the 'Reporter' user role, unless otherwise noted.

## 2.2. Key Tool Components

The beta Tool has five main components: Map View, Project Inputs; Project Outputs; Additional Documents and Resources; and Report Preview. Information provided by users via the Map View and Project Inputs generate Project Outputs. Additional Documents and Resources include the supplementary ***Climate Resilience Design Guidelines*** and best practices and optional Forms that provide design and implementation considerations informed by Project Inputs and Outputs. This component further includes key resources, such as the ***Glossary of Terminology*** and documents describing beta Tool methodology. The fifth component includes a Project Report specific to a user's individual project, summarizing inputs and outputs from the beta Tool.

The beta Tool process is captured in Figure 1, under User Guide sub-section 2.3. The documentation detailing the beta Tool methodology can be found under the Additional Documents and Resources tab.

### *Map View (1<sup>st</sup> tab in the beta Tool)*

The beta Tool's Map View component allows users to view and draw the location of their project by creating a GIS-based polygon. The display and functionality are described further in Section 3.2 of this User Guide.

### *Project Inputs (2<sup>nd</sup> tab in the beta Tool)*

The beta Tool prompts the user to input additional details related to the project's location, and the project's physical asset(s)<sup>1</sup> ("Project Inputs"). The inputs are structured by two components: (1) questions regarding overall project details and its climate exposure, and (2) questions related to individual physical asset(s) within the overall project. These inputs are captured through drop-down menu responses and select automated spatial queries.

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<sup>1</sup> In the beta Tool, an Asset is defined as a major physical component of a project. It is further organized by an Asset Category: building/facility, infrastructure, or natural resources.

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The display and functionality are described further in Section 3.2 of this User Guide. For additional documentation of the Project Inputs, refer to **Section 2: Project Inputs and Climate Risk Screening Output**, available under the Additional Documents and Resources tab.

### *Project Outputs (3rd tab in the beta Tool)*

The beta Tool has two main outputs: the Climate Risk Screening Output and the Recommended Climate Resilience Design Standards Output.

The Climate Risk Screening Output is intended to support project development and capital planning. **This is a preliminary screening output, and does not replace a formal risk and vulnerability assessment.** The Climate Risk Screening Output includes:

- a **preliminary exposure rating** for the overall project for each climate parameter: sea-level rise/ storm surge, extreme precipitation (urban and riverine), and extreme heat;
- a **preliminary risk rating** for each building and infrastructure asset within the overall project for each climate parameter: sea-level rise/ storm surge, extreme precipitation (urban and riverine), and extreme heat; and
- an **ecosystem services benefits score** for the overall project.

The main objective of the Recommended Climate Resilience Design Standards Output (“the Standards”) is to provide a consistent basis-of-design for assets across various projects in the Commonwealth related to the following climate parameters: sea level rise and storm surge, extreme precipitation, and extreme heat. The Standards for each asset include the following:

- **planning horizons** for each asset, inclusive of a target and intermediate planning horizon for sea level rise/ storm surge, and a target planning horizon for extreme precipitation and extreme heat;
- a **return period** for building and infrastructure assets, for the sea level rise/ storm surge and extreme precipitation climate parameters, and a **percentile**<sup>2</sup> for each asset, for the extreme heat climate parameter;
- **applicable design criteria** for each asset and climate parameter, based on asset type and project location; and
- **tiered methodology** based on the recommended level of effort that informs users on how to calculate design criteria values for asset and project design.

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<sup>2</sup> Percentile: For the extreme heat climate parameter, the Tool will provide a recommended percentile for each asset (10th, 50th, or 90th percentile), as opposed to a recommended return period. While an asset’s useful life does inform the recommended return period output for the sea level rise/ storm surge and extreme precipitation climate parameters, it does not inform the recommended percentile output for the extreme heat climate parameter. This difference is recommended since impacts from flooding are episodic, whereas impacts from heat are likely to be experienced by an asset regularly over its useful life and cannot be typically assigned a frequency of occurrence. The percentiles for design recommended by the Tool are also dependent on asset construction type, instead of asset type as for the sea level rise/ storm surge and extreme precipitation climate parameters. This difference is due to the difficulty in accommodating for extreme heat resilience in existing construction design.

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The display and functionality are described further in Section 3.2 of this User Guide. For additional documentation of the Project Outputs and beta Tool methodology, see **Section 2: Project Inputs and Climate Risk Screening Output** and **Section 3: Climate Resilience Design Standards Overview**, available under the Additional Documents and Resources tab.

### *Report Preview (4<sup>th</sup> tab in the beta Tool)*

The beta Tool further provides users with the opportunity to review and download their Project Report in the Report Preview tab. Here, users may view a summary of the project and asset outputs, informed by project inputs.

### *Additional Documents and Resources (5<sup>th</sup> tab in the beta Tool)*

The beta Tool also provides Climate Resilience Design Guidelines (“the Guidelines”) and Best Practices, Forms, and other supporting documents.

- The **Guidelines** are intended to be overarching climate resilience principles that are not specific to project/asset type or climate parameters. The Guidelines provide general design guidance for users to consider while implementing the Standards. These Guidelines are illustrated through specific best practices, which will include case studies and/or existing published resources that exemplify the Guidelines.
- A series of optional **Forms** walk users through Guidelines considerations and serve to document design and decision making throughout the process. These forms include the following:
  - **Site Suitability Form**
  - **Regional Coordination Form**
  - **Flexible Adaptation Pathways Form**
- Other supporting documents provided by the beta Tool include the **Glossary of Terminology** (for industry and beta Tool-specific definitions), **Responses to Questions Received During Stakeholder Outreach**, and section documentation (outlining beta Tool methodology), as follows:
  - **Section 1: Project Overview**
  - **Section 2: Project Inputs and Climate Risk Screening Output**
  - **Section 3: Climate Resilience Design Standards Overview**

### 2.3. Climate Resilience Design Standards and Guidelines Process

The overall process for the Climate Resilience Design Standards and Guidelines is shown in Figure 1, below, including the beta Tool. The beta Tool includes a Map View as part of the Project Inputs that enables users to draw the location of their project site as a polygon.

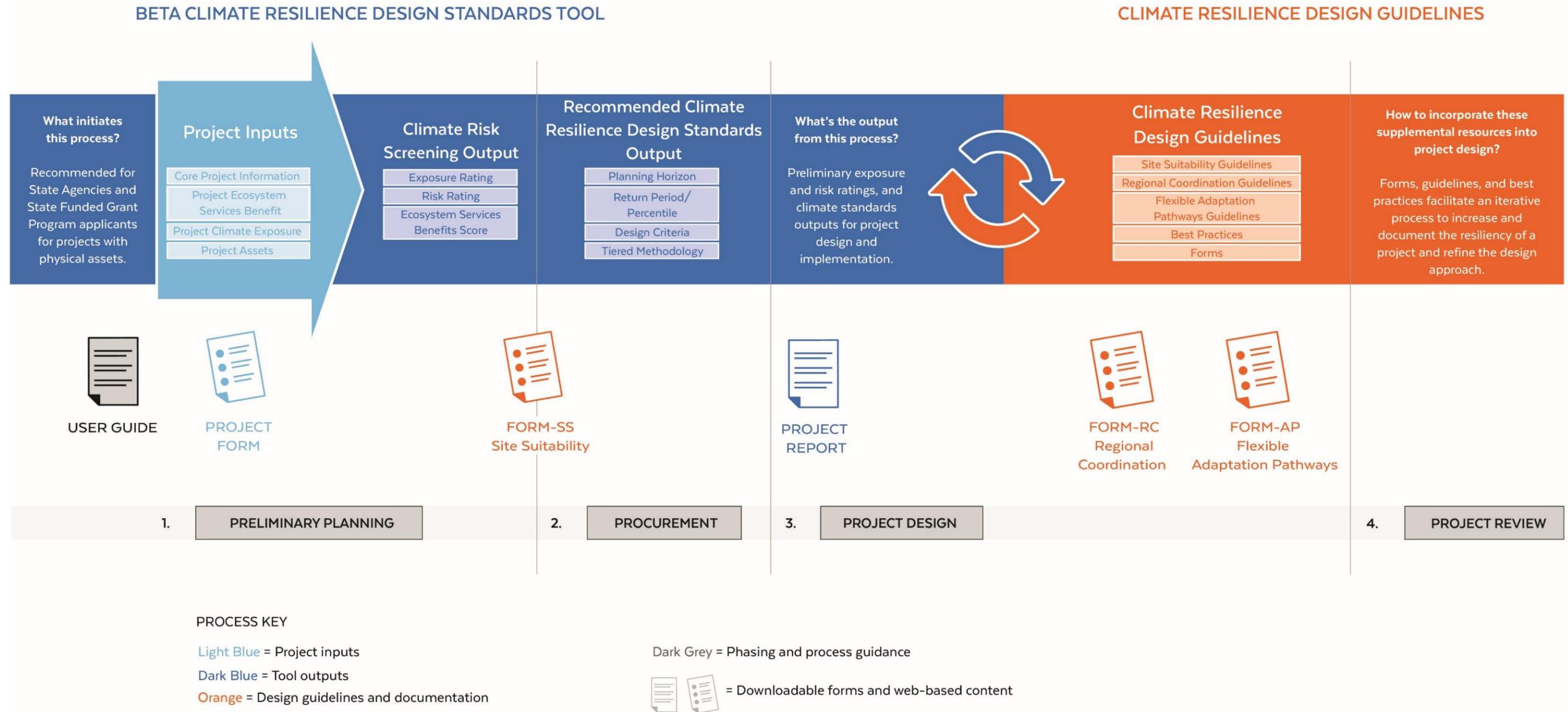


Figure 1. Overview Graphic showing the overall Project Inputs (light blue) and Project Outputs (dark blue) process and Guidelines (orange) of the Climate Resilience Design Standards and Guidelines.

### 3. Beta Tool Functionality and Features

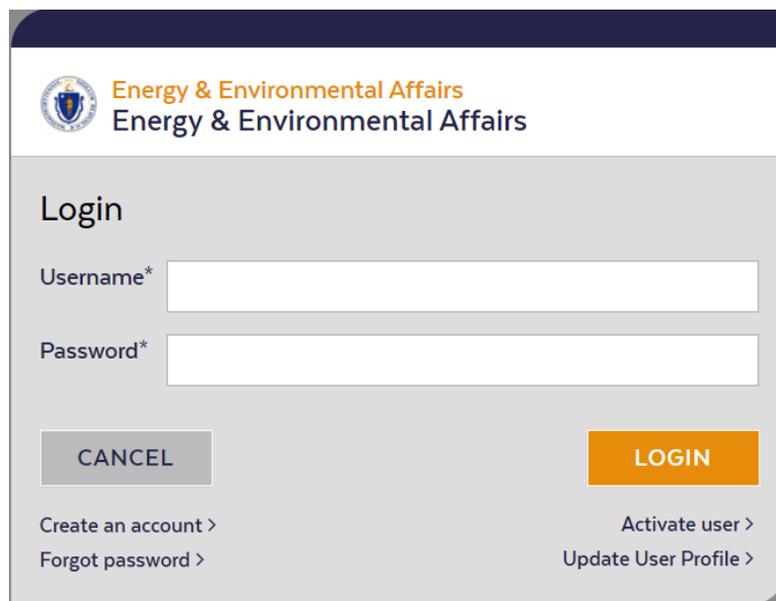
#### 3.1. General Functionality

The beta Climate Resilience Design Standards Tool and Guidelines are **accessible at ResilientMA.org**, and are relevant to state grant-funded projects throughout the Commonwealth and capital projects by various State agencies.

The direct link to the beta Tool is **accessible at** [\[https://resilientma.org/rmat\\_home/designstandards/\]](https://resilientma.org/rmat_home/designstandards/).

#### *Login*

Navigate to the beta Tool link, provided above, to begin login. Here, users can create an account, retrieve a password, activate a user, and update a user profile. The dashboard outlook for this login page is shown in Figure 2, below.



The screenshot shows a login dashboard for the Energy & Environmental Affairs department. At the top left is the state seal logo. To its right, the text reads "Energy & Environmental Affairs" in orange and "Energy & Environmental Affairs" in blue. Below this is a "Login" section with two input fields: "Username\*" and "Password\*". Underneath the fields are two buttons: a grey "CANCEL" button and an orange "LOGIN" button. At the bottom of the dashboard, there are four links: "Create an account >", "Forgot password >", "Activate user >", and "Update User Profile >".

Figure 2. Login dashboard for the beta Tool.

**Tip: Troubleshooting!** If users have trouble creating a log-in or accessing their account, please email questions to [rmat@mass.gov](mailto:rmat@mass.gov).

#### *Project Tabs*

There are five main navigation tabs in the beta Tool: Map View, Project Inputs, Project Outputs, Additional Documents and Resources, and Report Preview. These tabs can be found on the left side of the display, across the top.

**The remainder of this User Guide will proceed along the beta Tool process, moving through each tab view and it's associated functionality.**

### 3.2. Tab: Map View

In this display, users can search for an existing project, create a new project, and change base map layers. This display is useful in viewing the location of existing projects, whether still being edited or already submitted. The Map View page is shown in Figure 3, below.

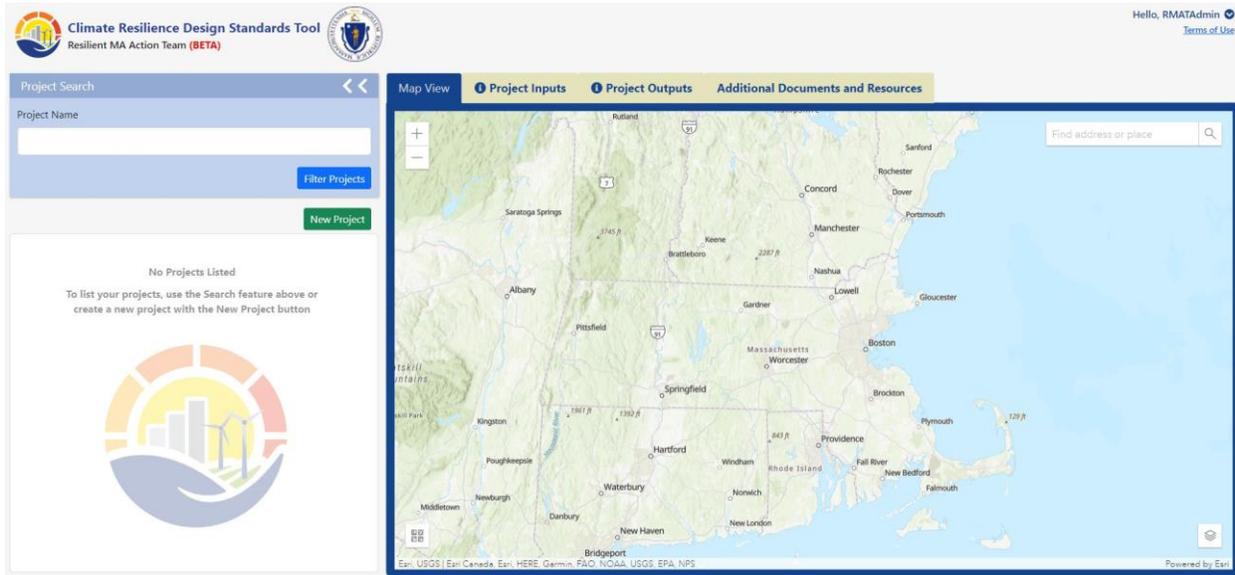


Figure 3. Map View tab in the beta Tool.

#### Search

To search for an existing project that has already been created, locate the “Project Search” box on the left side of the screen under “Project Name” and proceed with entering a search word for the project name. Reporters may only search and view results for projects they have created, while Viewers and Administrators can search and view all projects. Results will begin populating with relevant projects, previously saved. Select the “Filter Projects” button once complete. Refer to Figure 4, below.

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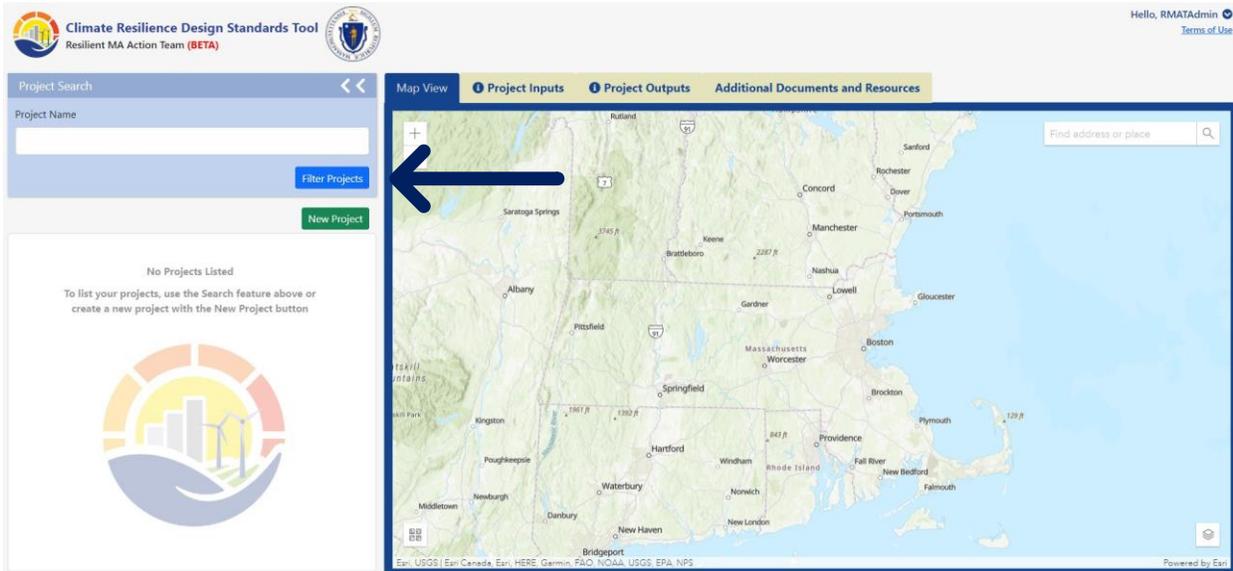


Figure 4. Project Search Box.

*New Project*

To create a new project within the beta Tool, select the “New Project” button. Enter a name for the new project. Click the green “Save” button to continue. If additional changes are necessary, click “Cancel”. Refer to Figures 5 and 6 for a review of this process, below.

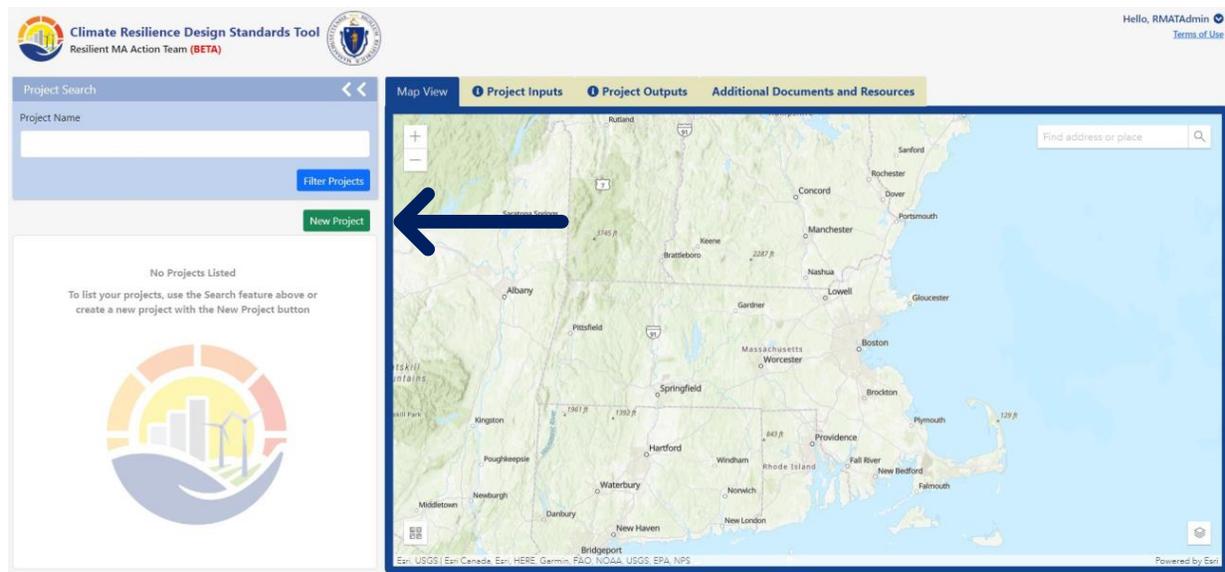


Figure 5. New project button location within the Map View.

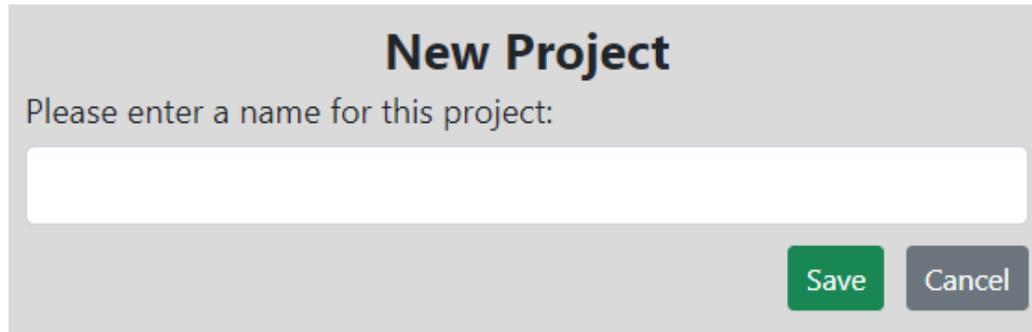


Figure 6. Enter a name for the new project.

### *Draw a Project Polygon*

This step involves drawing the location of the new project on the map. It is the first step to begin establishing Project Inputs in the beta Tool. This project polygon will be used to determine project exposure to climate parameters, hence it is important the polygon encompasses all (on-site) physical assets of the project.

Follow the instructions on the screen to draw the project polygon, as shown in Figure 7. Select the “Polygon” button shown in Figure XX, located in the top right corner of the map, to begin drawing the project polygon. The drawn polygon is now a feature. Refer to Figures 7 through 9, below.

**Tip: Watch the how-to video!** Avoid confusion by clicking on the “Show me how” button (shown in Figure 7) to watch a short video on how to draw the project polygon.

**Tip: Avoid bad polygons!** Avoid creating polygons that loop back onto themselves. This generates separate and distinct polygons. If this is accidentally generated, please “Delete” the polygons and redraw.

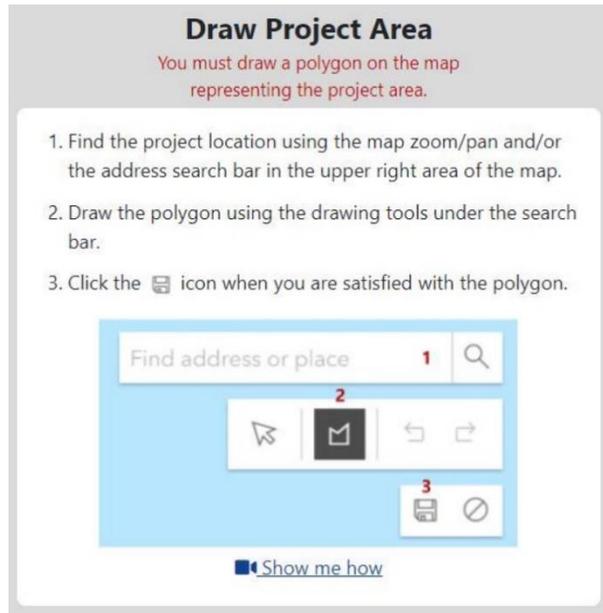


Figure 7. Draw Project Area (polygon) instructions.

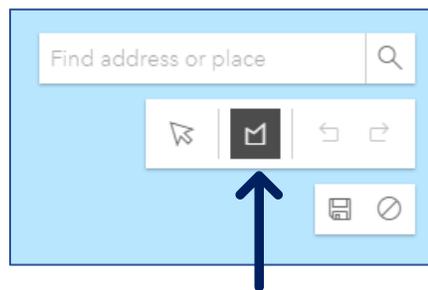


Figure 8. "Draw a polygon" button.

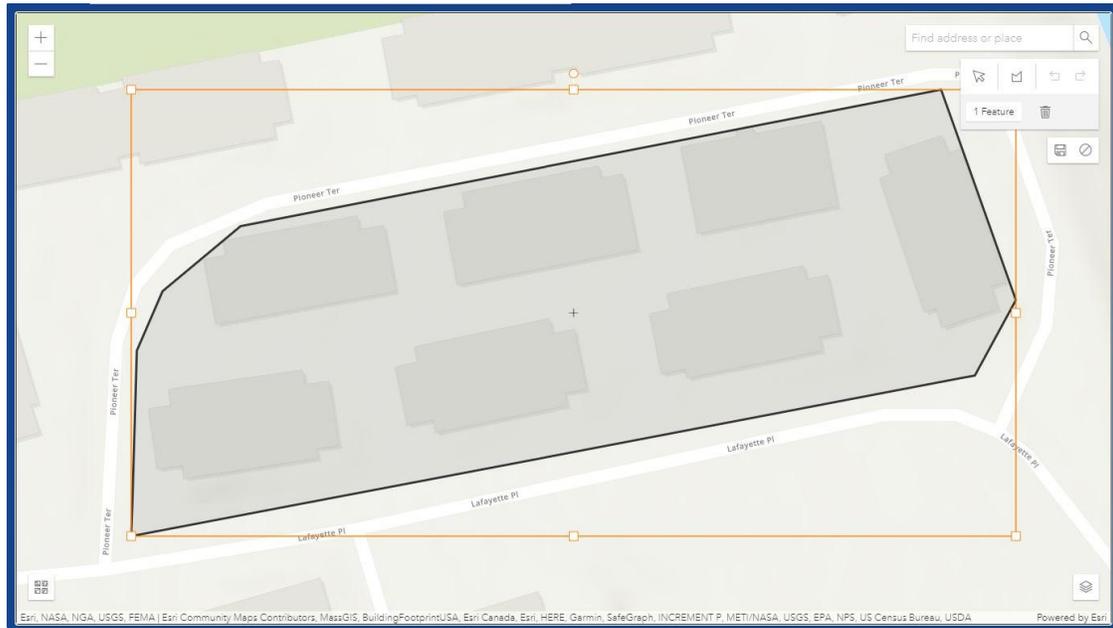


Figure 9. Example of a complete project polygon, saved.

### *Save or Cancel the Project Polygon*

Once the drawn polygon is complete, users can “Save” or “Cancel” their drawing using the buttons shown in Figure 10, below. Note that on this display, users can “Find address or place” to search the map, use the arrow pointer to select polygon objects, or “Undo” and “Redo” actions. **Users should further be aware that they will not receive project outputs unless their project polygon has been saved.** Also, once saved, any edits to the project polygon will result in rescoring of the project outputs.

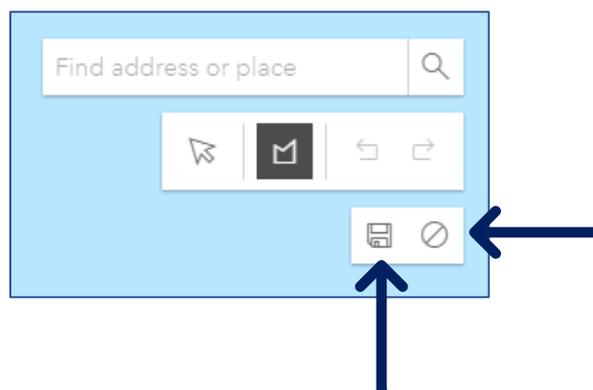


Figure 10. “Save” or “Cancel” a drawn polygon.

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### *Edit the Project Polygon*

To edit the project polygon once it has been saved, click on the project name in the Project panel on the left side of the screen. Viewing the project, select “Edit.” The project polygon can now be moved and resized, as shown in Figure 11. Double-click on the polygon feature already formed to edit the polygon’s vertices. “Delete” polygons using the trash icon (above the “Save” button at the top right corner).

**Tip: Don’t forget to Save any changes made in Edit mode!**



Figure 11. Example polygon in editing form.

### *Viewing a Project Polygon*

When returning to an existing project highlighted under “Results”, selecting a project in the left projects panel will automatically zoom to the project polygon, as shown in Figure 12, below.



Figure 12. Example completed project polygon.

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### 3.3. Tab: Project Inputs

Once the user has completed drawing and editing the project polygon, they move to the “Project Inputs” view, shown in Figure 13. This tab, to the right of the “Map View” tab, directs the user through inputting required information. The beta Tool prompts the user to input details related to the overall project and the project’s physical asset(s).

This tab is broken down into four different steps to provide required information for output generation:

- Step 1: Core Project Information
- Step 2: Project Ecosystem Services Benefit
- Step 3: Project Climate Exposure
- Step 4: Project Asset(s)

Each “Step” is a series of questions to select or toggle for responses. The beta Tool then uses these inputs, including the project polygon drawn by the user, to generate the Project Outputs.

**Tip: There’s more on Project Inputs!** Refer to **Section 2: Project Inputs and Climate Risk Screening Output**, available under the Additional Documents and Resources tab, to learn more about Project Inputs and how they were established.

The screenshot displays the 'Project Inputs' tab interface. At the top, there is a navigation bar with four tabs: 'Map View', 'Project Inputs' (which is the active tab and highlighted in blue), 'Project Outputs', and 'Additional Documents and Resources'. A 'Delete Project' button is located in the top right corner. Below the navigation bar, the main content area is organized into four distinct steps, each with a dropdown arrow on the right side. Step 1, 'Core Project Information', is currently expanded and contains a form with the following elements: a red error message icon and text: 'Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?'; a text input field for 'Name' containing 'newtest'; a text input field for 'Location of Project'; a text input field for 'Estimated Capital Cost'; a text input field for 'Entity Submitting Project'; a question 'Is this project being submitted as part of a state grant application?' with a 'No' radio button selected; a question 'Is climate resiliency a core objective of this project?'; a question 'Is this project being submitted as part of the state capital planning process?'; a question 'Is this project being submitted as part of a regulatory review process?'; and a text input field for 'Brief Project Description:'. Step 2 is 'Project Ecosystem Services Benefit' with a note: '(Please identify whether the project provides the following ecosystem services benefits to the project site or surrounding area)'. Step 3 is 'Project Climate Exposure' with a note: '(Click each question to answer and save. All questions in red are required)'. Step 4 is 'Project Assets'.

Figure 13. Project Inputs tab view.

### Step 1: Core Project Information

The first set of inputs required for a project consists of the core project information. To complete these questions, click on the question or the space next to the question, and either a drop-down, fill-in-the-black, or pre-populated answer choice will appear. After selecting or responding, click the “Save” button for each question to lock in the answer. Answers can be modified and resaved as needed using the “Save” button. The Steps to complete this process are illustrated in Figures 14 through 16, below.

**Tip: Don’t forget to Save after each question!** Don’t forget this step--all questions are required. Unanswered questions will appear in red, while completed saved responses will appear in black.

**Step 1 Core Project Information** (Click each question to answer and save. All questions in red are required)

Name: UserGuide Testing

**Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?** [Dropdown] Save Cancel

Location of Project: [Dropdown: Abington, Acton, Acushnet] Save Cancel

Estimated Capital Cost: [Text Field] Save Cancel

Entity Submitting Project: [Text Field] Save Cancel

Is this project being submitted as part of a state grant application? No

Is climate resiliency a core objective of this project? No  Yes Save Cancel

Is this project being submitted as part of the state capital planning process? No  Yes Save Cancel

Is this project being submitted as part of a regulatory review process? No  Yes Save Cancel

Brief Project Description: [Text Field] Save Cancel

Figure 14. Example unanswered questions in Step 1.

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**Step 1 Core Project Information** (Click each question to answer and save. All questions in red are required)

Name: UserGuide Testing

**1** Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)? 2030 - 2039

Location of Project:

Estimated Capital Cost:

Entity Submitting Project:

Is this project being submitted as part of a state grant application? No  Yes

Is climate resiliency a core objective of this project? No  Yes

Is this project being submitted as part of the state capital planning process? No  Yes

Is this project being submitted as part of a regulatory review process? No  Yes

Brief Project Description:

Figure 15. Example inputs before saving of Step 1 questions.

**Step 1 Core Project Information**

Name: UserGuide Testing

Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)? 2030 - 2039

Location of Project: Salem

Estimated Capital Cost: \$4,444,444.00

Entity Submitting Project: Executive Office of Housing and Economic Development / Department of Housing and Community Development

Is this project being submitted as part of a state grant application? No

Is climate resiliency a core objective of this project? No

Is this project being submitted as part of the state capital planning process? No

Is this project being submitted as part of a regulatory review process? No

Brief Project Description: Enter brief project description here.

Figure 16. Example responses to Step 1 questions upon saving.

Certain questions, as indicated, may display an information icon **i** for further details or definitions. Clicking on the icon will reveal this information. An example is shown below in Figure 17.

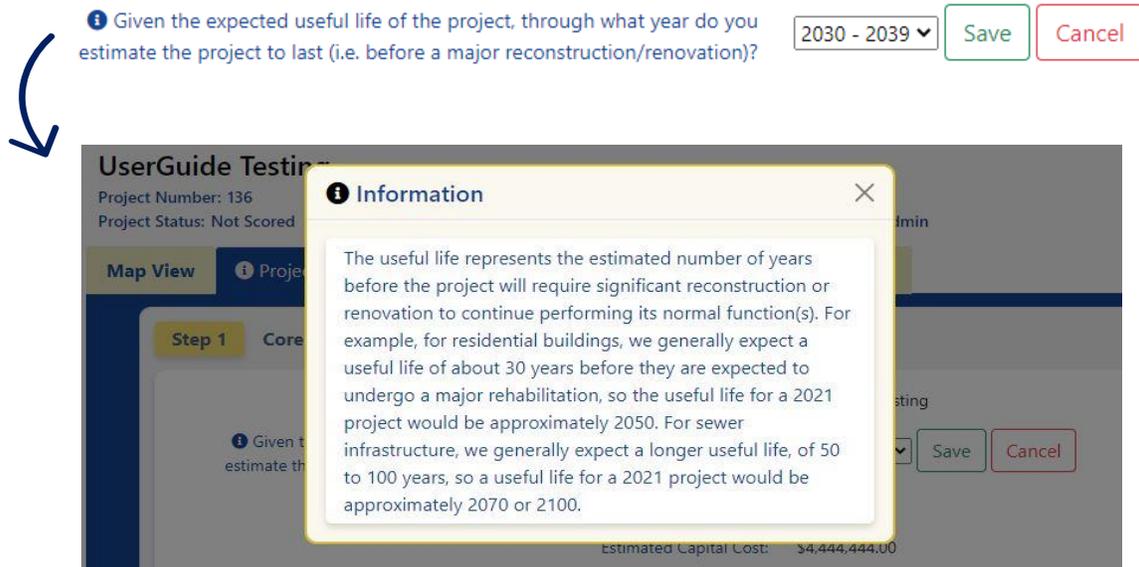


Figure 17. Example selection of the information icon for a question in Step 1.

### Step 2: Project Ecosystem Benefits

In order to provide a preliminary assessment of the ecosystem services that an overall project provides, a series of project ecosystem benefits questions must be completed, as shown in Figure 18. Responses to these questions come in a Yes/No toggle, and definitions are provided through the information icon **i** on the left side of the question. **Note: The ecosystem service should be answered by considering the overall project, not specific to an asset.**

Question	No	Yes	Save	Cancel
<b>i</b> Provides flood protection through green infrastructure or nature-based solutions	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Provides storm damage mitigation	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Provides groundwater recharge	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Protects public water supply	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Filters stormwater	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Improves water quality	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Promotes decarbonization	<input type="radio"/>	<input checked="" type="radio"/>	Save	Cancel
<b>i</b> Enables carbon sequestration	<input type="radio"/>	<input checked="" type="radio"/>	Save	Cancel
<b>i</b> Provides oxygen production	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Improves air quality	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Prevents pollution	<input type="radio"/>	<input checked="" type="radio"/>	Save	Cancel
<b>i</b> Remediates existing sources of pollution	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Protects fisheries, wildlife, and plant habitat	<input type="radio"/>	<input type="radio"/>	Save	Cancel
<b>i</b> Protects land containing shellfish	<input type="radio"/>	<input type="radio"/>	Save	Cancel

Figure 18. Example of an (unsaved) ecosystem service benefits scoring page of Step 2.

### Step 3: Project Exposure Questions

In order to provide a preliminary assessment of a project’s exposure to climate parameters (sea level rise/ storm surge, extreme precipitation, and extreme heat), users must answer questions regarding the history of on-site flooding, impervious areas, and trees. Additional information icons are available to assist users in answering the project exposure questions. Additional details about a project’s exposure to climate parameters are assessed geospatially by the beta Tool, based on project polygon location, as drawn by the user. The sequence of steps and example expanded information are shown below in Figures 19 through 21.

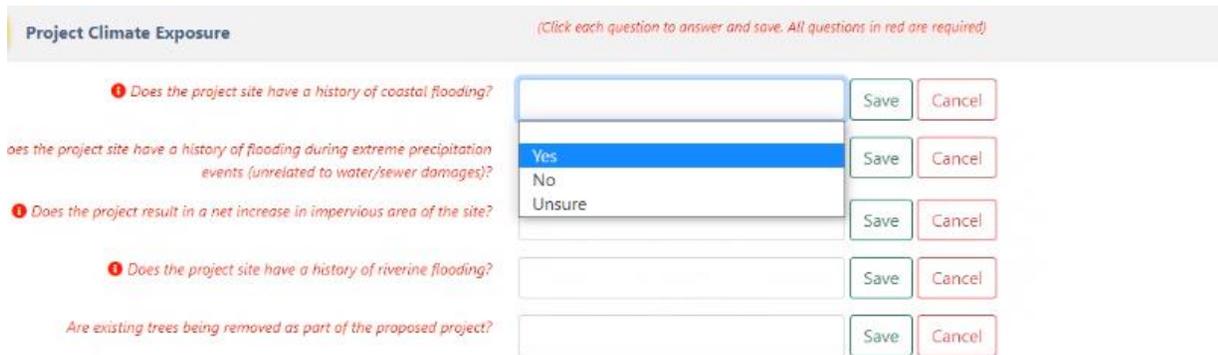


Figure 19. Example drop-down options for Step 3 questions.



Figure 20. Example responses to Step 3 project exposure questions.

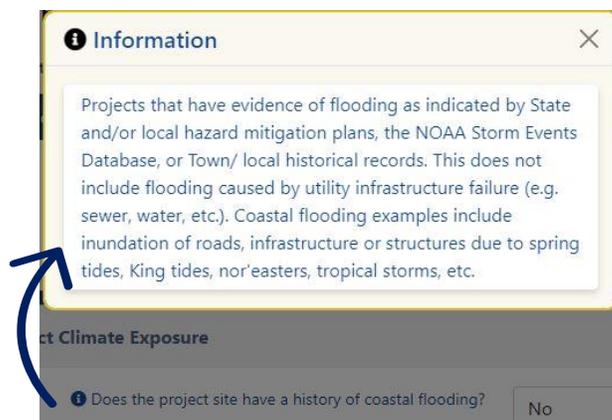


Figure 21. Example expanded information icon for a Step 3 question.

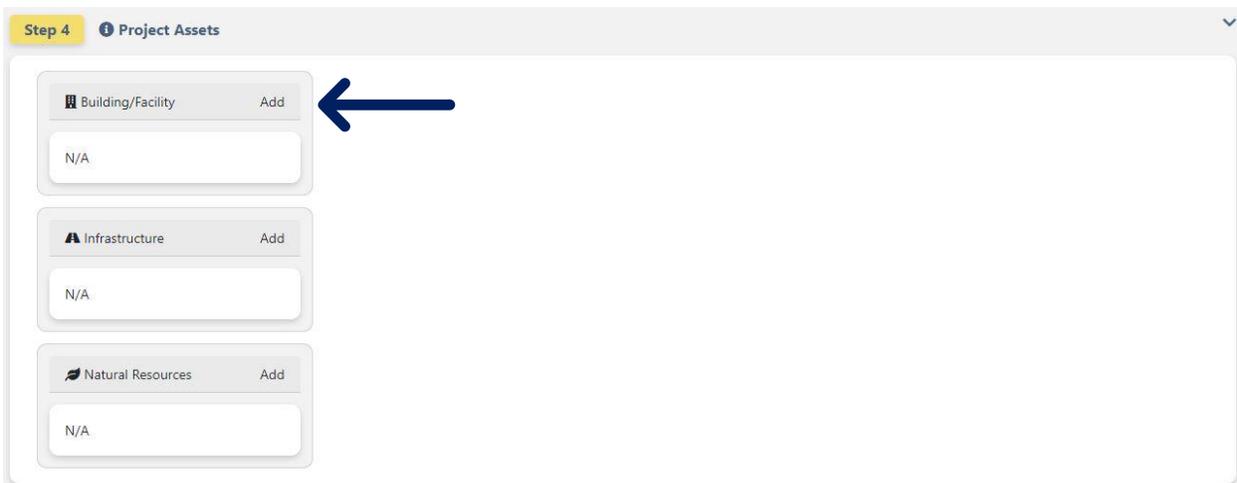
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### Step 4: Project Assets

An asset is defined as a major physical component of a project, organized into an **Asset Category: building/facility, infrastructure, or natural resources**. In this section, users are prompted to identify all major physical assets present in the project, and answer questions related to each asset. To add an asset, the user should select the “Add” button under the three main Asset Categories, as shown in Figure 22. The user may add multiple assets under each Asset Category, as necessary. For example, a park improvement project may include assets such as a berm for a flood control structure as an *infrastructure* asset, a living shoreline as a *natural resources* asset, and a park facility as a *building/facility* asset.



The screenshot shows a web interface titled "Step 4 Project Assets". It features three vertically stacked panels, each representing an asset category. The top panel is for "Building/Facility", the middle for "Infrastructure", and the bottom for "Natural Resources". Each panel has a header with a small icon, the category name, and an "Add" button. Below the header is a text input field containing "N/A". A blue arrow points to the "Add" button of the "Building/Facility" category.

Figure 22. Button location to add a Building/Facility asset.

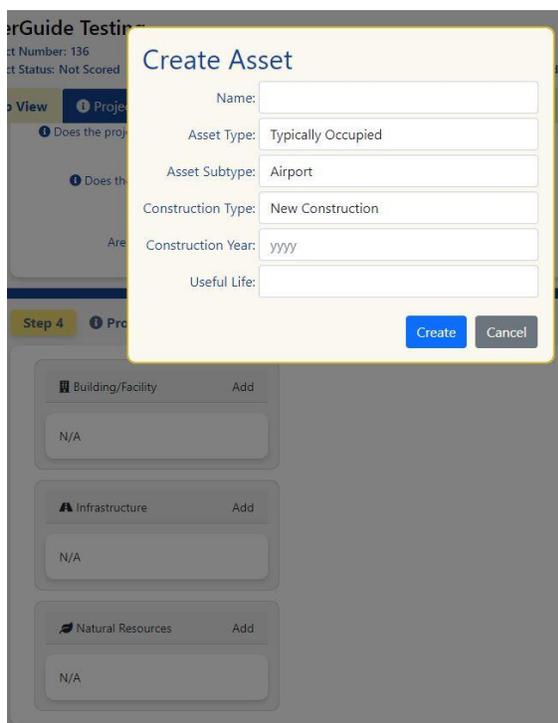
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Upon selecting the “Add” button, the user must fill out asset information to “Create Asset”. Asset Type, Sub-Type, and Construction Type are all drop-down boxes, for users to select based on what is most representative of the individual asset. **Construction Year refers to the year in which construction is expected to start on the asset. Useful Life refers to the estimated number of years before the project will require significant reconstruction or renovation to continue performing its normal function(s).** This differs from the design life, which is typically shorter. Once the information is inputted, click the “Create” button to save that asset. If further changes are necessary, click “Cancel”. This process is illustrated in Figures 23 and 24, below.

**Tip: Finalize asset details before selecting Create!** Once the Create button is selected, only the Construction Type, Construction Year, and Useful Life can be modified.

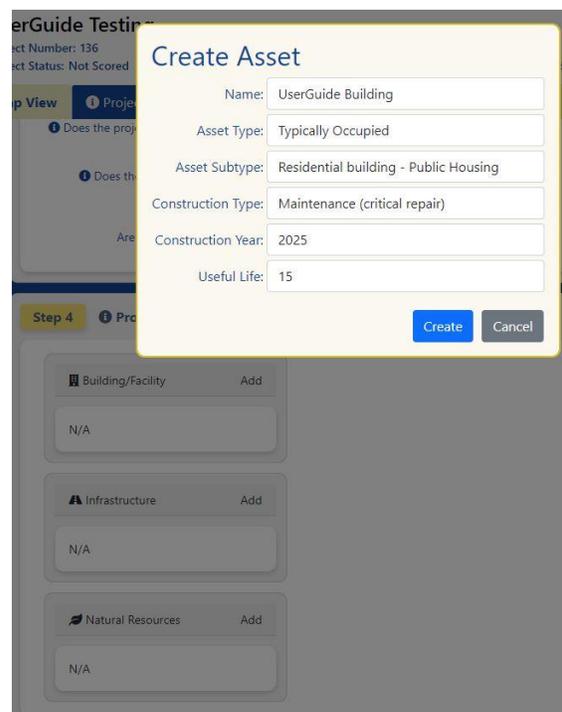


The screenshot shows a 'Create Asset' modal form with the following fields:

- Name: (empty)
- Asset Type: Typically Occupied
- Asset Subtype: Airport
- Construction Type: New Construction
- Construction Year: yyyy
- Useful Life: (empty)

Buttons for 'Create' and 'Cancel' are visible at the bottom right of the form.

Figure 23. Example of an incomplete "Create Asset" form.



The screenshot shows a 'Create Asset' modal form with the following fields:

- Name: UserGuide Building
- Asset Type: Typically Occupied
- Asset Subtype: Residential building - Public Housing
- Construction Type: Maintenance (critical repair)
- Construction Year: 2025
- Useful Life: 15

Buttons for 'Create' and 'Cancel' are visible at the bottom right of the form.

Figure 24. Example of a completed "Create Asset" form.

If an asset was added erroneously, the user can “Delete” the asset using the trash can icon in the upper right corner. The Construction Type, Construction Year, and asset Useful Life can be further modified upon selection of the heading and saving. Remember to “Save” each response. These actions are shown in Figure 25, below.

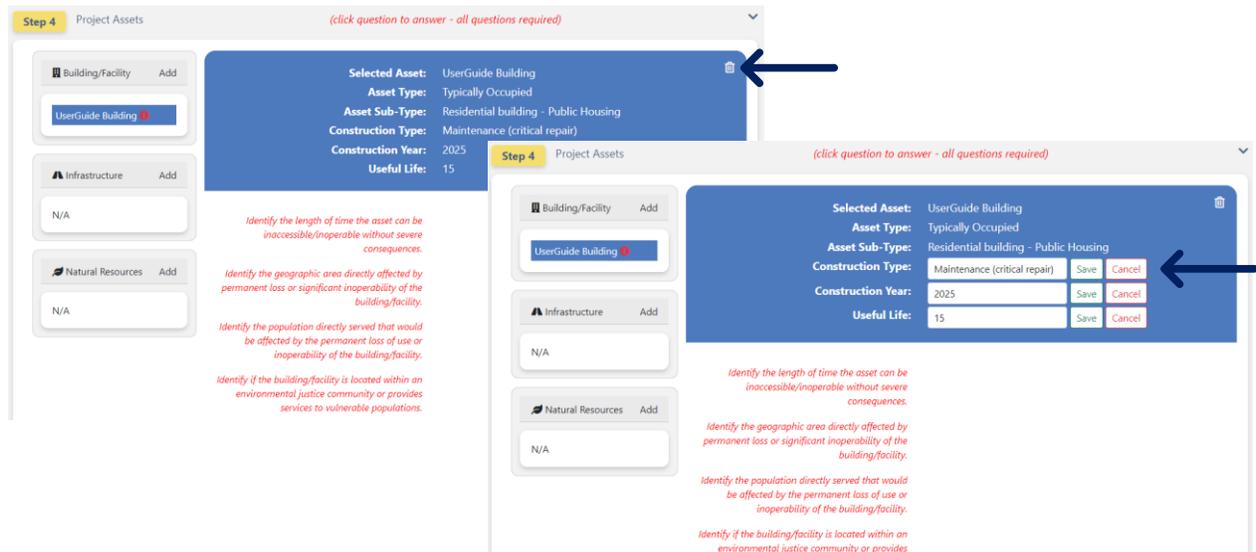


Figure 25. Deleting an asset and editing asset details.

Once a building/facility and/or infrastructure asset is added, the user must answer questions to inform the asset’s preliminary risk screening and standards outputs. To answer a question, click on the question itself, as shown in Figure 26. **All questions should be completed within the context of the selected answer for the first question, “Identify the length of time the asset can be inaccessible/inoperable without severe consequences.”**

**Note: Natural resources assets will not be prompted to answer these questions.**

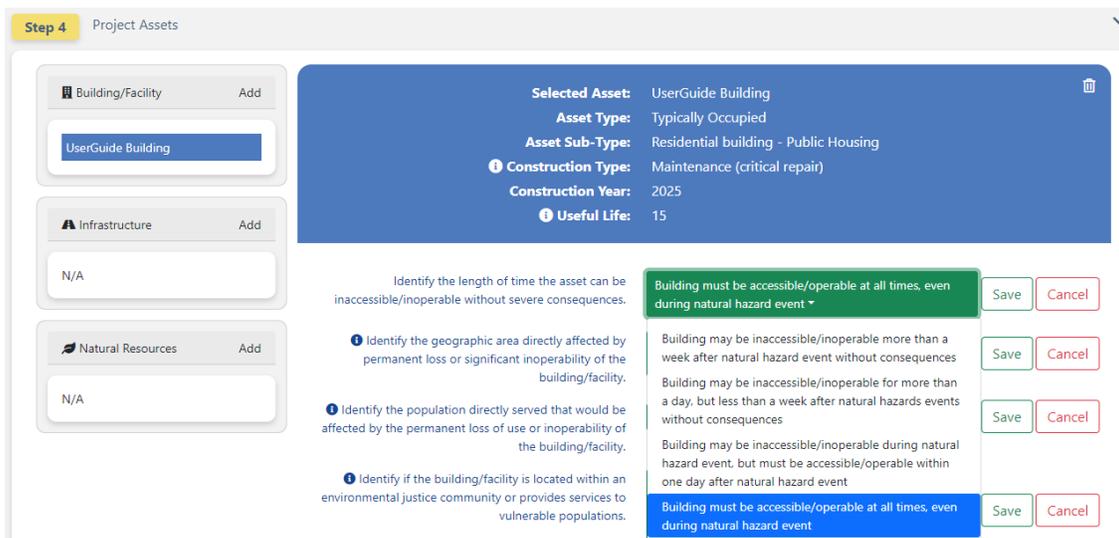


Figure 26. Example drop-down selection of a building/facilities asset's first question.

Once all project and asset(s) inputs have been completed and saved, and the outputs are ready to be reviewed, a “Scored” symbol will appear on the left side of the screen, adjacent to the project name, as shown in Figure 27, below.

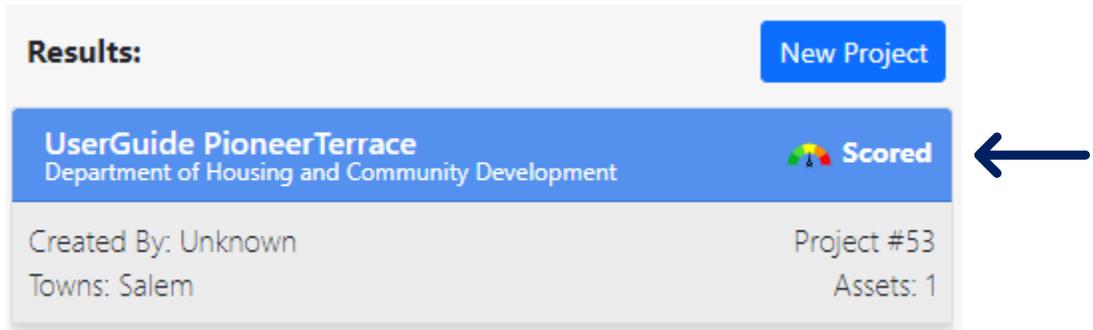


Figure 27. Example of a Scored project alert, under project Results of the “Map View” tab. This signals completion of the Project Inputs section.

*Step 5: Review Project Outputs & Step 6 Submit Project*

Once users have reviewed and finalized the project and asset(s) inputs, the user should proceed to Step 5, to review Project Outputs, shown in Figure 28. Refer to [Section 3.4. Tab: Project Outputs](#) for a description of Project Outputs.

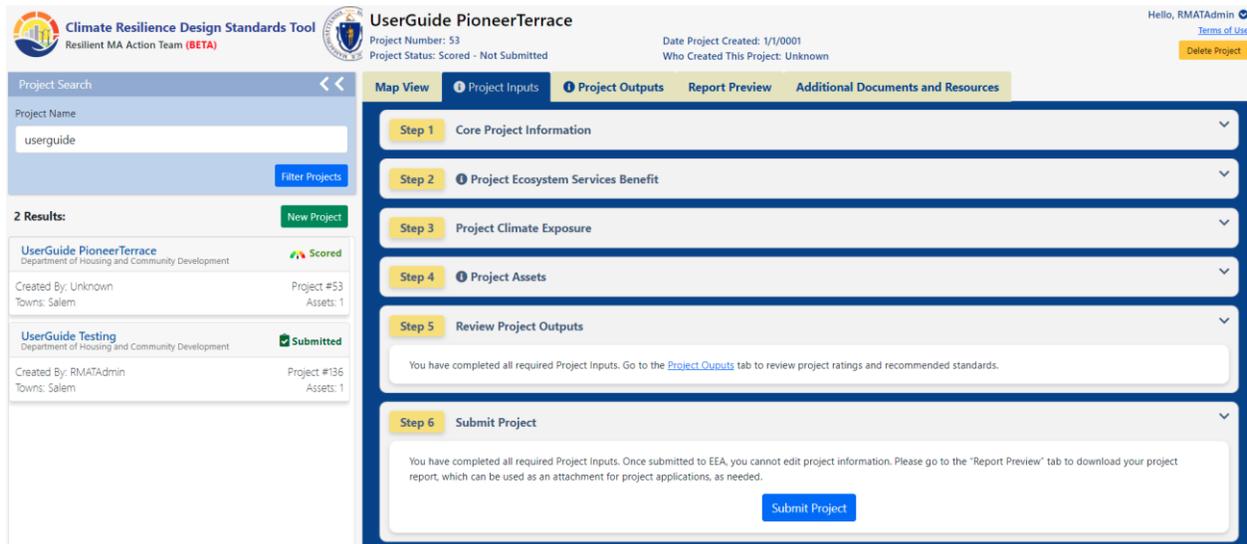


Figure 28. Project Outputs link and Submit Project button location.

Upon finishing review of Project Outputs and completion of Project Inputs, users may then proceed to Step 6 to Submit their project to EEA. Once a project is submitted, you can still search for your project and you will see a green check mark and submitted next to the project, as shown in Figure 29.

**Note: No Project or Asset(s) Inputs can be changed upon submitting the project.**

**Results:** New Project

---

**UserGuide PioneerTerrace** Submitted  
 Department of Housing and Community Development

---

Created By: Unknown Project #136  
 Towns: Salem Assets: 1

Figure 29. Example of a submitted project alert, under project Results of the “Map View” tab. This signals that the project has been submitted and no additional changes may be made.

**Congrats! The Project Inputs are completed and successfully submitted .**

### 3.4. Tab: Project Outputs

Upon completion of the Project Inputs, the user may then navigate to the “Project Outputs” tab, shown in Figure 30, below. Here, the user can view the selected project’s and asset’s Climate Exposure and Risk Screening Output and Recommended Climate Resilience Design Standards Output. The Ecosystem Benefits Score and Exposure Scores are assigned to the overall project, while the Risk Scores and Standards are asset-specific.

Ecosystem Service Benefits Score and Preliminary Climate Exposure Ratings are available for each project, under “Project Scores” (below the first light blue banner). Projects with multiple assets will show different Standards for *each* asset, under “Asset Preliminary Climate Risk Rating and Recommended Standards” (below the second light blue banner). Users can navigate between assets by selecting the assets on the left side of the screen, under “Project Assets” (below the second light blue banner). This is illustrated in Figure 30 and 31, below.

Figure 30. Overview of the “Project Outputs” tab.



Figure 31. Example project with two listed Project Assets.

**Tip: There's more on Project Outputs!** Refer to **Section 2: Project Inputs and Climate Risk Screening Output** and **Section 3: Climate Resilience Design Standards Overview**, available under the Additional Documents and Resources tab, to learn more about Project Outputs and how they were established.

#### *Ecosystem Service Benefits Score*

The purpose of this output is to provide an overall indication of the ecosystem service benefits (ESB) provided by a project, through protection of natural resources and implementation of nature-based solutions. Low ESB scores, as shown in Figure 32, indicate projects do not provide substantial benefits to ecosystem services and suggests that nature-based solutions are not part of project design. High ESB scores indicate that projects significantly benefit ecosystems and suggests nature based solutions are a central part of the overall project. Users are encouraged to identify how their project may provide or protect ecosystem services in design to increase this score. Additional guidance is available in the **Section 3: Climate Resilience Design Standards Overview** documentation, under the Additional Documents and Resources tab.

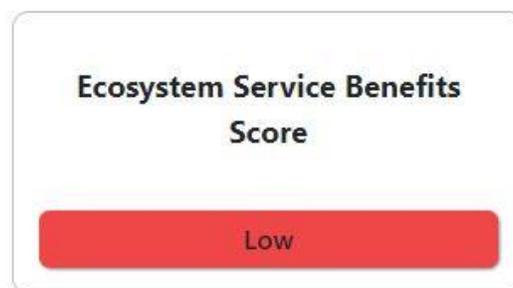


Figure 32. Example of a project's overall Ecosystem Service Benefits Score.

### *Preliminary Climate Exposure Rating*

The purpose of this output is to provide a preliminary assessment of whether the project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change.

Preliminary Climate Exposure Ratings are calculated based on submitted Project Inputs—the project location polygon and user question responses, analyzed for each climate parameter: sea level rise and storm surge, extreme precipitation (urban and riverine), and extreme heat.

For each climate parameter, the beta Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. An example of this output for a project is shown in Figure 33. **Note: The exposure is not based on individual asset locations—only the overall project location. The exposure rating does not substitute a formal vulnerability assessment.**



Figure 33. Example of a project's Preliminary Climate Exposure Rating for each climate parameter.

For project locations exposed to sea level rise and storm surge, the user will receive the first Planning Horizon in which the site is exposed to coastal flooding for the 100-year or 1% annual exceedance probability (AEP) flood event. This can be viewed in the expanded dashboard, found by selecting the icon, as shown in Figure 34.

Users may view additional information about why the project received each exposure rating upon selection of the icon. These descriptions vary for each climate parameter and are based on resulting Project Inputs and GIS-based analysis within the beta Tool.

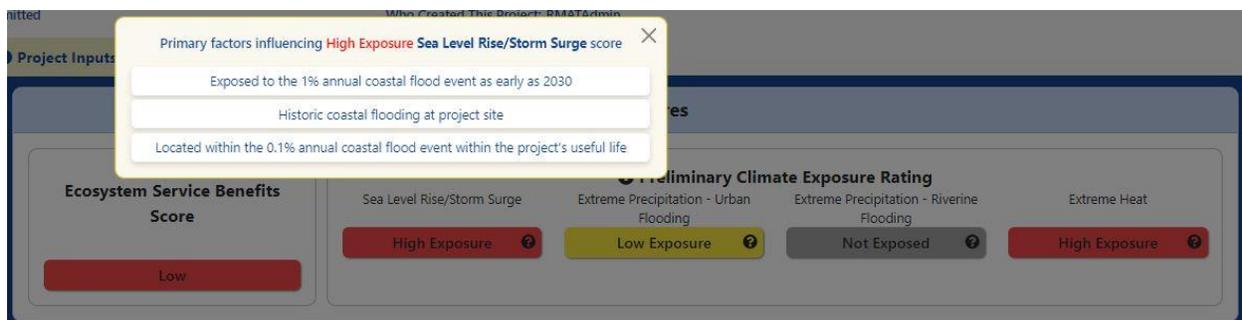


Figure 34. Expanded exposure rating dashboard output for an example project with a High Exposure to Sea Level Rise/Storm Surge.

### Preliminary Climate Risk Rating

The purpose of this output is to provide an initial screening to identify projects and assets with a High Risk designation, which may warrant additional review and/or design considerations.

A Preliminary Risk Rating is determined for each applicable climate parameter, and for building, and infrastructure assets, based on the Preliminary Exposure Rating and responses to questions provided by the user. An example output for each climate parameter is shown in Figure 35, with the expanded dashboard output providing further detail on the inputs informing the high risk output shown in Figure 36. **Note: Natural resources assets will not receive a Preliminary Risk Rating output as part of the Climate Risk Screening Output, as natural resources were exempt from risk ratings as part of the methodology.**



Figure 35. Example Preliminary Climate Risk Rating outputs for each climate parameter.



Figure 36. Example expanded risk rating output for an asset.

**Resilient Massachusetts Action Team**

Climate Resilience Design Standards and Guidelines

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*Recommended Climate Resilience Design Standards Output*

The beta Tool provides Recommended Climate Resilience Design Standards (“the Standards”). The Standards include the following recommendations to inform design of each asset:

**Table 1.** Standard Output Recommendations Provided by the beta Tool

Standards Output Recommendations	Example
Planning Horizon <sup>1</sup>	2070
Return Period <sup>2</sup>	100-year (1% AEP)
Percentile <sup>3</sup>	50 <sup>th</sup> percentile
Design Criteria	Rainfall depth, design flood elevation, cooling degree days, etc.
Tiered Methodology	Tier 3 – High Level of Effort

1. Inclusive of a target and intermediate planning horizon for sea level rise/ storm surge, and a target planning horizon for extreme precipitation and extreme heat.

2. For coastal and precipitation climate parameters only. Return periods recommendations are not provided for natural resource assets.

3. For heat climate parameters only.

For definitions of key terminology in the beta Tool, refer to the informational icon  located next to text. For documentation of the methodology behind these recommendations, see **Section 3: Climate Resilience Design Standards Overview** documentation, located under the Additional Documents and Resources tab.

Standards are recommended for each asset and climate parameter, show in Figure 37, below. Tiered methodologies are provided for applicable design criteria for users to calculate values for design. Users may download the tiered methodology by selecting the download icon, also shown in Figure 37.



Figure 37. Recommended Climate Resilience Design Standards Output by climate parameter.

The following Figures will guide users through recommended Standards outputs for each Climate Parameter. **Note: Applicable design criteria are shown with green checkmarks. Red crosses indicate design criteria that are not relevant or recommended to be calculated for the particular asset.**

**Sea Level Rise / Storm Surge:** As shown in Figure 38, below, users will receive a target and intermediate planning horizon, return period, relevant design criteria, and a tiered methodology for calculating design criteria values. The applicable design criteria are based on Asset Type and Project Location, informed by GIS-based exposure to sea level rise / storm surge. **Users may download the tiered methodology documents via the download button in the bottom right corner.**



Figure 38. Example of recommended Standards for Sea Level Rise/Storm Surge, relevant to the project.

Certain sea level rise/storm surge design criteria (Tidal Benchmarks; Stillwater Elevation; Design Flood Elevation, Wave Heights) are standards outputs from the Massachusetts Coast Flood Risk Model (MC-FRM) and these recommended values are anticipated to be available directly in the beta Tool in a forthcoming update Summer 2021. Additional information is available in the beta Tool, as shown in Figure 39, below.

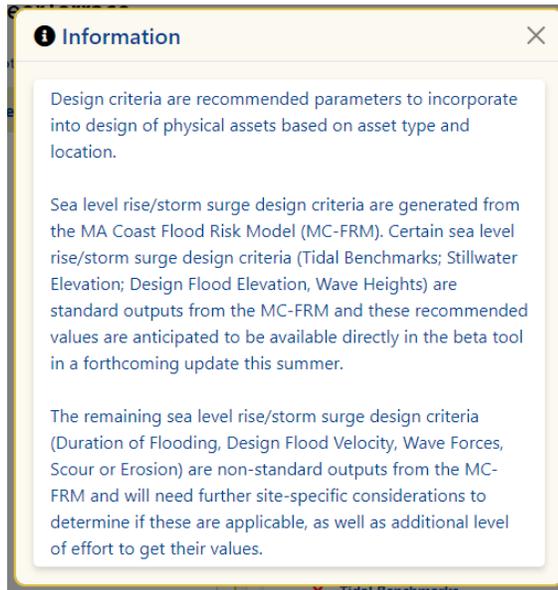


Figure 39. Expanded information icon for Sea Level Rise/Storm Surge Applicable Design Criteria

**Extreme Precipitation:** As described above in Table 1 and shown in Figure 40, below, users will receive a target planning horizon, return period, applicable design criteria, and a tiered methodology for calculating design criteria values. The applicable design criteria are based on Asset Type and Project Location, informed by GIS-based exposure to extreme precipitation for riverine and urban flooding. **Users may download the tiered methodology documents via the download button in the bottom right corner.**

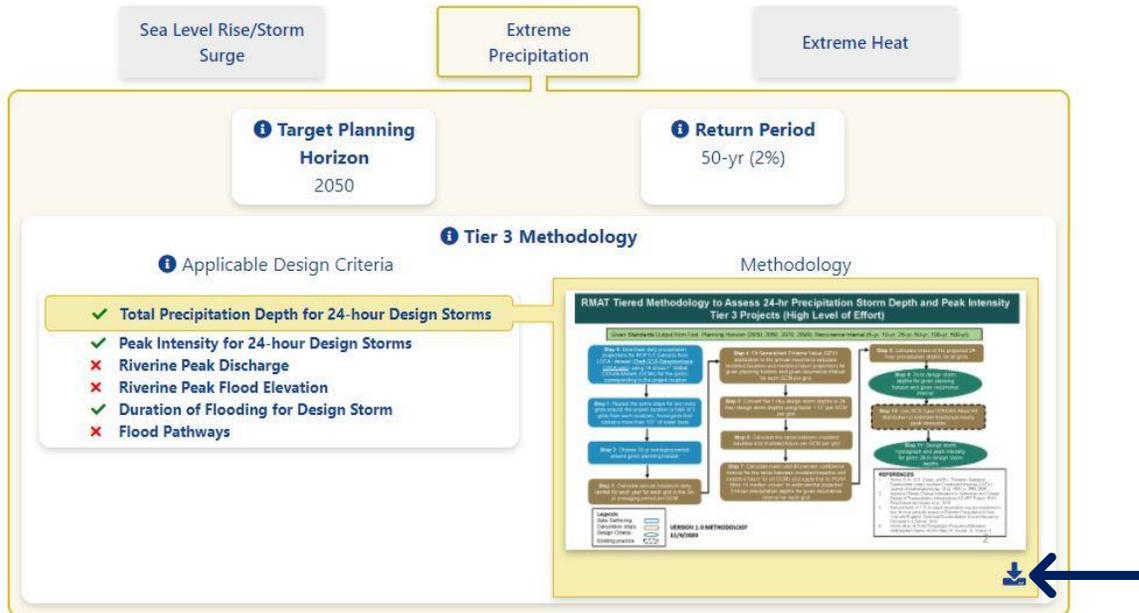


Figure 40. Example of recommended Standards for Extreme Precipitation, relevant to the project.

**Extreme Heat:** As described in Table 1, above and shown in Figure 41, below, users will receive a target planning horizon, percentile, applicable design criteria, and a tiered methodology for calculating design criteria values. The applicable design criteria are based on Asset Type and Project Location. **Users may download the tiered methodology documents via the download button in the bottom right corner.**

The screenshot displays the 'Extreme Heat' tab of the design standards tool. It features three main sections: 'Target Planning Horizon' set to 2050, 'Percentile' set to 50th Percentile, and 'Tier 3 Methodology'. The methodology is split into 'Applicable Design Criteria' and 'Methodology'. The criteria list includes 10 items, with 9 checked (green) and 1 unchecked (red X). The methodology document is titled 'RESILIENT MASSACHUSETTS ACTION TEAM (RMAT) CLIMATE RESILIENCE DESIGN STANDARDS TEMPERATURE DESIGN CRITERIA TIERED METHODOLOGY' and includes page ranges for Tier 3 and Tier 2 & 1 projects. A download icon is visible in the bottom right corner of the methodology preview, highlighted by a blue arrow.

Figure 41. Example of recommended Standards for Extreme Heat, relevant to the project.

**Congrats! The Project Outputs have been reviewed.**

### 3.5. Tab: Report Preview

Upon review of the Project Outputs, users may proceed to viewing and downloading their Project Report under the Report Preview tab. Here, the Project Inputs and Outputs have been summarized in report format and are available for download. The Project Report can then be printed for inclusion with grant submissions. An example of this tab can be previewed in Figure 42, below.

**UserGuide PioneerTerrace**  
 Project Number: 53 | Date Project Created: 1/1/0001  
 Project Status: Scored - Not Submitted | Who Created This Project: Unknown

**Project Summary**

UserGuide PioneerTerrace  
 Estimated Construction Cost: \$4444444.00  
 Estimated Project Life: 2039

Ecosystem Benefits	Scores
Project Score	Low
Exposure	Scores
Sea Level Rise/Storm Surge	High Exposure
Extreme Precipitation - Urban Flooding	Low Exposure
Extreme Precipitation - Riverine Flooding	Not Exposed
Extreme Heat	High Exposure

**Asset Summary**

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
UserGuide Building	High Risk	Moderate Risk	Low Risk	High Risk

**Project Outputs**

Sea Level Rise Storm Surge	Target Planning Horizon	Intermediate Planning Horizon	Return Period	Methodology

Figure 42. Example Report Preview tabular view.

Users should click the button “Generate Report” to generate the report for their project. Once users have generated a report, users will be able to click the button “Download Report” to download the report. A PDF of the report will then download to the download folder of the web browser.

The report is in a PDF format, as shown in Figure 43 below. There will be a link in the upper right corner “Link to Project” that directs users back to the beta Tool if clicked.

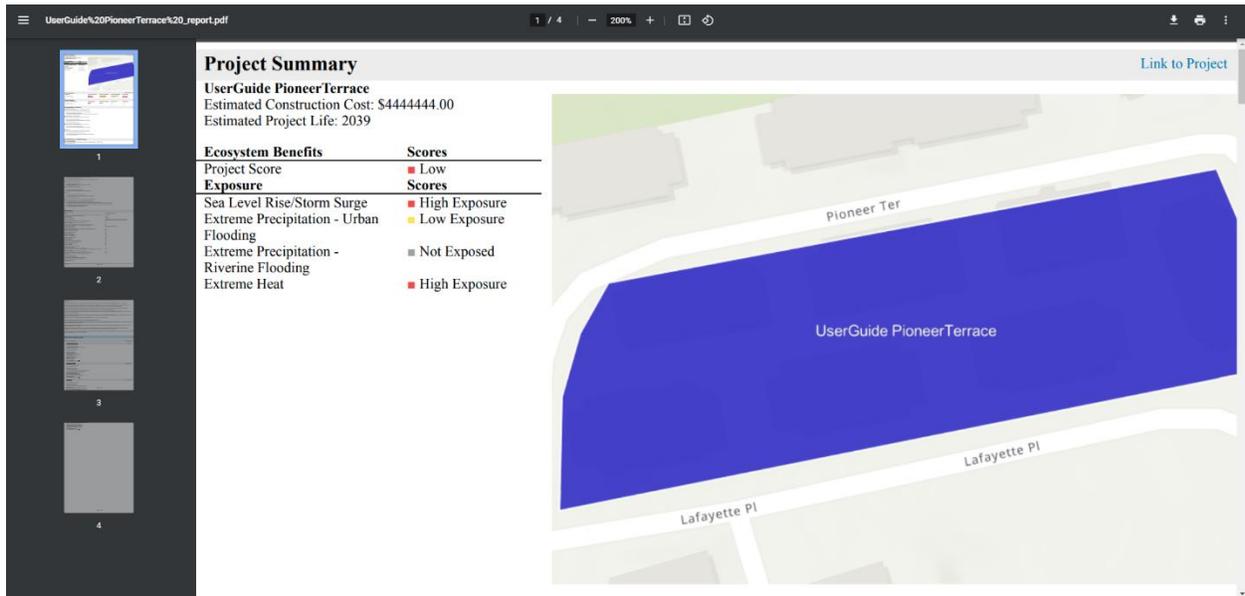


Figure 43. Example Downloaded Report in Browser Window.

**Tip: Share the Project URL!** Users can copy their project url(s) from the beta Tool’s address bar and share the url(s) with others. This way others can view and/or edit the project inputs until they have been submitted.

**Tip: Generating the report does not submit the report!** Users should go back to the Project Inputs tab and proceed to Step 6 to submit their project, shown in Figure 44, below.

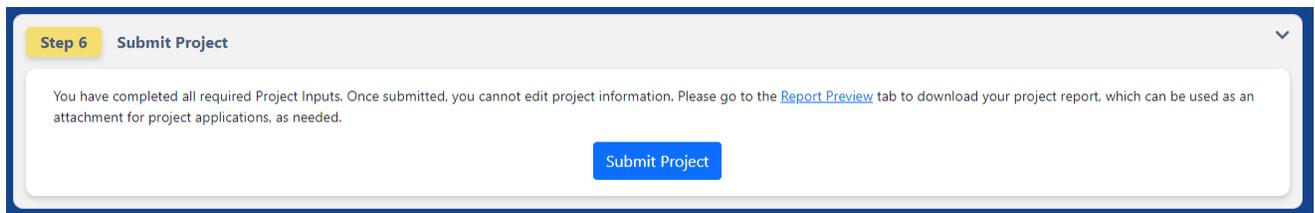


Figure 44. Step 6 of Project Inputs - Submit Project.

**Tip: Wait, your work isn’t done!** Review the Guidelines and Forms in the last tab: Additional Documents and Resources. These supplemental materials support the design phase and serve to document climate resilience decision-making.

### 3.6. Tab: Additional Documents and Resources

Once users have received the Project Outputs, users should share the outputs with their broad team, using the results to inform design decisions. The Additional Documents and Resources are recommended to help in this effort. The Additional Documents and Resources are composed of four downloadable documents: one for all of the Guidelines and Best Practices, and one for each of the three recommended Forms.

#### *Guidelines*

Supplemental resources that provide principles and best practices for implementing the Standards. The Guidelines constitute design principles related to site suitability, flexible adaptation strategies and regional coordination that are illustrated through forms and specific “best practices,” which may include case studies and/or existing published resources that exemplify the Guidelines.

#### *Site Suitability Form*

Optional form aimed at evaluating how geographic location, existing conditions, and asset placement impact the sites’ ability to serve its intended function, before, during, and after climate impacts.

#### *Regional Coordination Form*

Optional form aimed at guiding considerations of how coordination and collaboration across regions, as well as State Agencies and jurisdictions, can help strengthen resilient designs and implementation.

#### *Flexible Adaptation Pathways Form*

Optional form aimed at evaluating project design strategies that are able to adapt over time and respond to changing climate conditions, while encouraging climate mitigation, prioritizing nature-based solutions, and preparing for current and future operations and maintenance needs.

Selection of these Guidelines and Forms is shown in Figure 45, below.



Figure 45. Downloadable content related to the Climate Resilience Design Guidelines and Forms.

## Resilient Massachusetts Action Team

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Additional documents included under the Additional Documents and Resources tab are the User Guide, Section documents (outlining the overall project, and detailed methodology related to Project Inputs and Project Outputs), **Glossary of Terminology**, and **Responses to Questions from Stakeholder Outreach**, as shown in Figure 46. The purpose of these documents is to further aid the user in understanding the beta Tool's functionality and output implications.

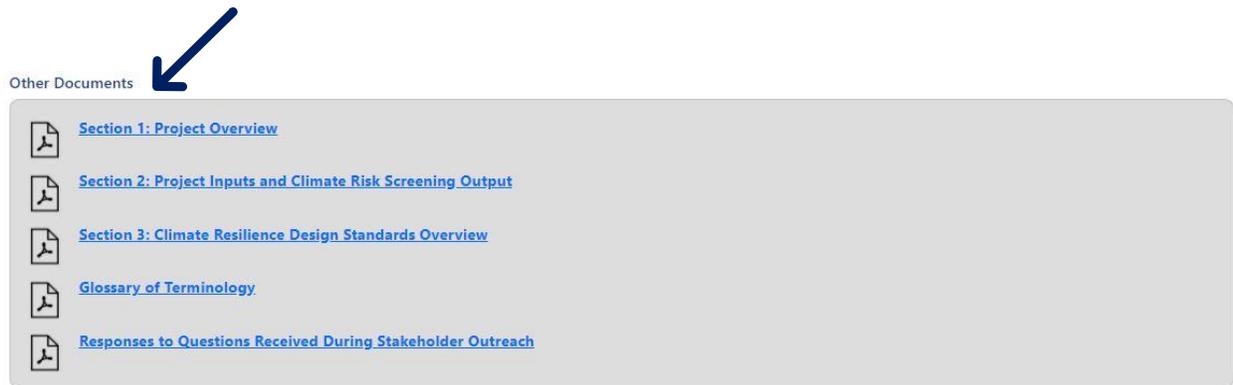


Figure 46. Additional documents included under the Additional Documents and Resources tabs for user reference.